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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole 50-00-12

Borehole Information

Farm :	T	**Tank :**	T	**Site Number :**	299-W10-53
N-Coord :	43,711	**W-Coord :**	75,774	**TOC Elevation :**	671.96
Water Level, ft :	140.5	**Date Drilled :**	10/31/1944		

Casing Record

Type :	Steel-welded	Thickness, in. :	0.237	ID, in. :	4
Top Depth, ft. :	0	Bottom Depth, ft. :	151		
Type :	Steel-welded	Thickness, in. :	0.280	ID, in. :	6
Top Depth, ft. :	0	Bottom Depth, ft. :	151		

Cement Bottom, ft. : 151 **Cement Top, ft. :** 0

Borehole Notes:

Borehole 50-00-12 was drilled in October 1944, concurrently with the tank farm construction, and completed to a depth of 151 ft. The final borehole construction included a 6-in.-diameter casing from the ground surface to 151 ft. Drilling records indicate that a cement (grout) plug was placed at the bottom of the borehole and the 6-in. casing was pre-perforated between 50 and 150 ft.

The exact configuration for this borehole cannot be reconstructed. The logging engineers reported grouted 4-in. and 6-in.-diameter casings at the ground surface. It is apparent that this borehole was modified when the 4-in. casing was placed inside the 6-in. casing. Unfortunately, the records describing the modifications were not available. There is no information on how deep the 4-in.-diameter casing extends, but it is assumed to be the total depth of the borehole (151 ft). Grout is also assumed to be present because it was standard practice in the T Tank Farm to grout the annular space after a borehole was modified. Log data for this borehole were processed on the assumption that the borehole is double cased throughout its length with schedule-40, 4-in.- and 6-in.-diameter casings set to the bottom of the logged interval (142.5 ft).

The top of the 4-in.-diameter casing is the zero reference for the SGLS, which is even with the ground surface.

Equipment Information

Logging System :	2B	**Detector Type :**	HPGe	**Detector Efficiency:**	35.0 %
Calibration Date :	10/1997	**Calibration Reference :**	GJO-HAN-14	**Logging Procedure :**	MAC-VZCP 1.7.10-1

Logging Information

Log Run Number :	1	**Log Run Date :**	06/15/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	32.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Event A

Borehole 50-00-12

Log Run Number :	2	**Log Run Date :**	06/16/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	31.0	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	92.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	06/17/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	142.5	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	91.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged by the SGLS in three log runs operating in the move-stop-acquire mode, stopping every 6 in. and collecting spectra data for 200 s. The total logging depth achieved was 142.5 ft. This borehole contained standing water below 140.5 ft during logging.

Analysis Information

Analyst : R.R. Spatz

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 09/02/1998

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the calibration spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

The casing correction factor for a 0.50-in.-thick steel casing was applied to the concentration data during the analysis process. This casing correction factor was applied because it most closely matched the 0.517-in. total combined thickness of the 4-in. and 6-in. casings. A grout correction was not made because none is available. A water correction was not applied because none is available for 4-in.-diameter boreholes. Use of this casing correction factor will cause radionuclide concentrations to be underestimated.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

Log Event A

Borehole 50-00-12

A plot of selected historical gross gamma-ray data collected between April 1978 and January 1979 is included.

Results/Interpretations:

The radionuclide concentrations identified in this section are reported as apparent concentrations only and are underestimated.

The only man-made radionuclide detected in this borehole was Cs-137. Cs-137 contamination was detected from the ground surface to 1 ft and continuously from 11 to 14.5 ft. The apparent concentrations ranged from 0.15 to 1.5 pCi/g. Cs-137 contamination occurs intermittently between 40 and 140 ft at apparent concentrations ranging from 0.15 to 0.5 pCi/g. The maximum apparent Cs-137 concentration for this borehole was 1.5 pCi/g detected at 11.5 ft.

The K-40 concentrations detected from the ground surface to 40 ft are about 9 pCi/g. Between 40 and 72 ft, the K-40 concentrations decrease sharply and range between 2 and 6 pCi/g; the U-238 and Th-232 concentrations also decrease in this interval. Measured K-40 concentrations decrease sharply at 78, 118, and 142 ft from about 8 to 4 pCi/g above and below these depths. The K-40 concentrations increase to about 12 pCi/g between 83 and 86 ft, which also corresponds with an increase in the Th-232 concentrations. The K-40 concentrations detected between 89 and 104 ft range between 6 and 9 pCi/g. Between 99 and 104 ft, the U-238 concentrations increase. At 110 ft, the K-40 and Th-232 concentrations increase slightly.